CHAPTER 1

PLANS, SPECIFICATIONS, AND COLOR CODING

LEARNING OBJECTIVE: *Interpret basic plans, drawings, and specifications in construction operations. Recognize crew leader responsibilities* and *safety color-coding standards.*

In the day-to-day work as a Utilitiesman, you will be installing, assembling, inspecting, and troubleshooting many types of utility systems. To do these jobs properly, you must read and interpret plans and drawings. You may also have to read specifications that contain additional information on the details of construction and installation. Plans and specifications help you in doing the job correctly and safely.

After studying this topic, you should be able to read and interpret simple drawings and sketches as well as using the specifications to help you with more complex plans. Additionally, you should be able to draw simple shop drawings and specify the hazards associated with each color code for piping and compressed gas containers.

PLANS

LEARNING OBJECTIVE: *Identify the arrangement of a set of project blueprints and types of plans and drawings.*

You will be working with several types of plans and drawings. These may range from simple shop drawings and sketches, made perhaps by your immediate supervisor, to construction blueprints created by engineers. For the most part you will be working with plans created by architects and engineers. In Seabee construction, a complete set of plans for a project consists of civil, architectural, structural, electrical and mechanical plans, or drawings. You will be spending the majority of your time with mechanical drawings, but you will need all of these plans together to obtain a full picture of your part of that project and how to accomplish it.

CIVIL PLANS

Civil plans, or site plans, encompass a variety of drawings and. information. They furnish essential data, such as land contours, roads, utilities, trees, structures, site preparation and development, and significant physical features, on or near the construction site (fig. 1-1)

ARCHITECTURAL PLANS

Architectural plans show the architectural design and composition of a building. They include floor plans, exterior elevation plans, and door and window schedules (fig. 1-2).

STRUCTURAL PLANS

Structural plans show the support of the building or structure, including walls, columns, beams, foundation, roof, and deck slab. They also show their relationship to each other (figs. 1-3 and 1-4).

ELECTRICAL PLANS

Electrical plans contain the electrical distribution system plans, interior wiring drawings, and electrical component schedules for a building, or structure. They show wiring circuits, light switches, receptacles, light fixtures, and equipment (fig. 1-5).

MECHANICAL PLANS

Mechanical plans include layouts and details for systems of plumbing, heating, ventilating, air conditioning, and refrigeration (fig. 1-6). These systems vary, depending on whether they are for a permanent installation with the most modern fixtures and equipment or for a temporary installation where less complex equipment is used. Whatever the job, you

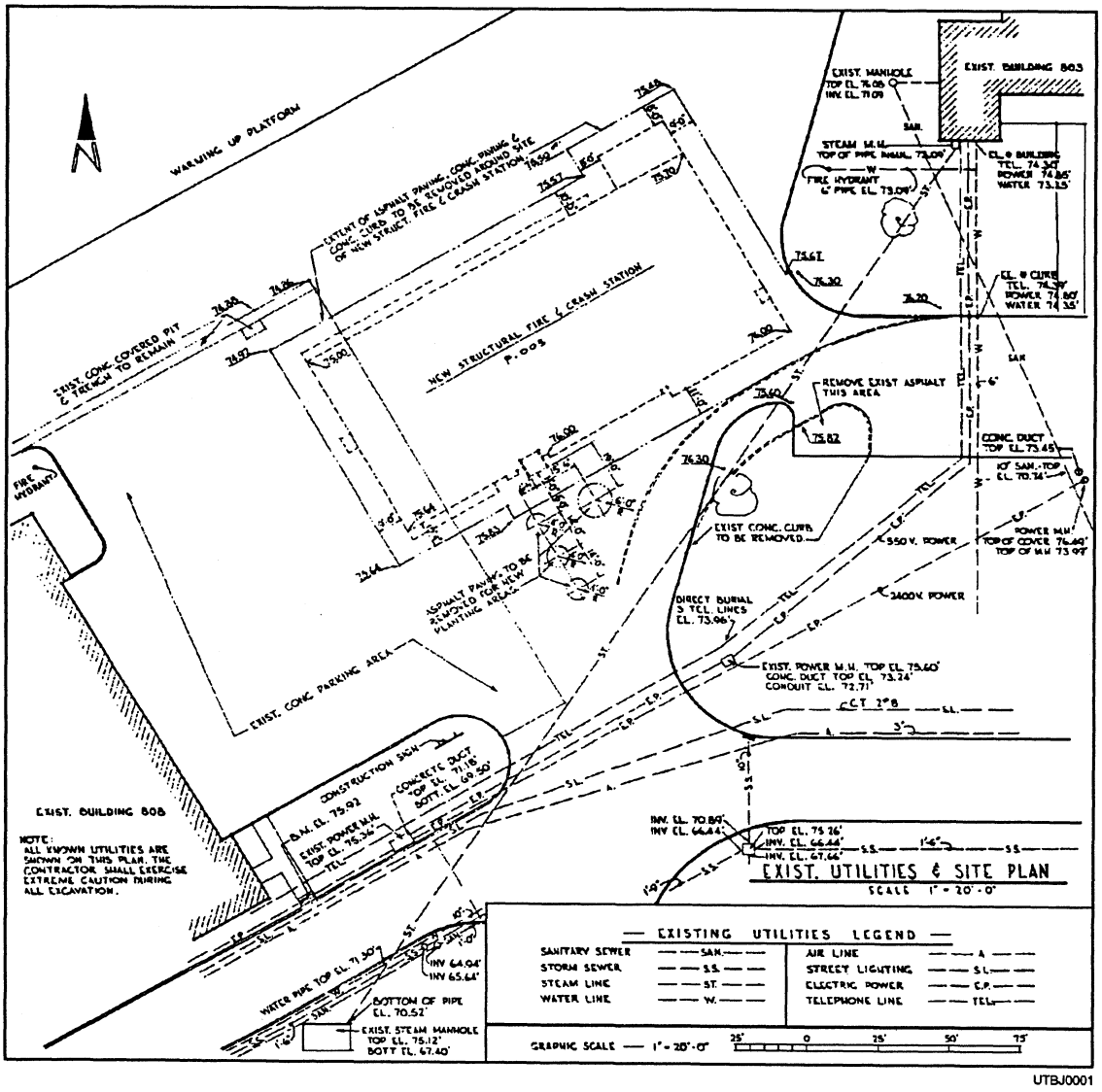

Figure 1-1.—Civil or site plan with existing utilities.

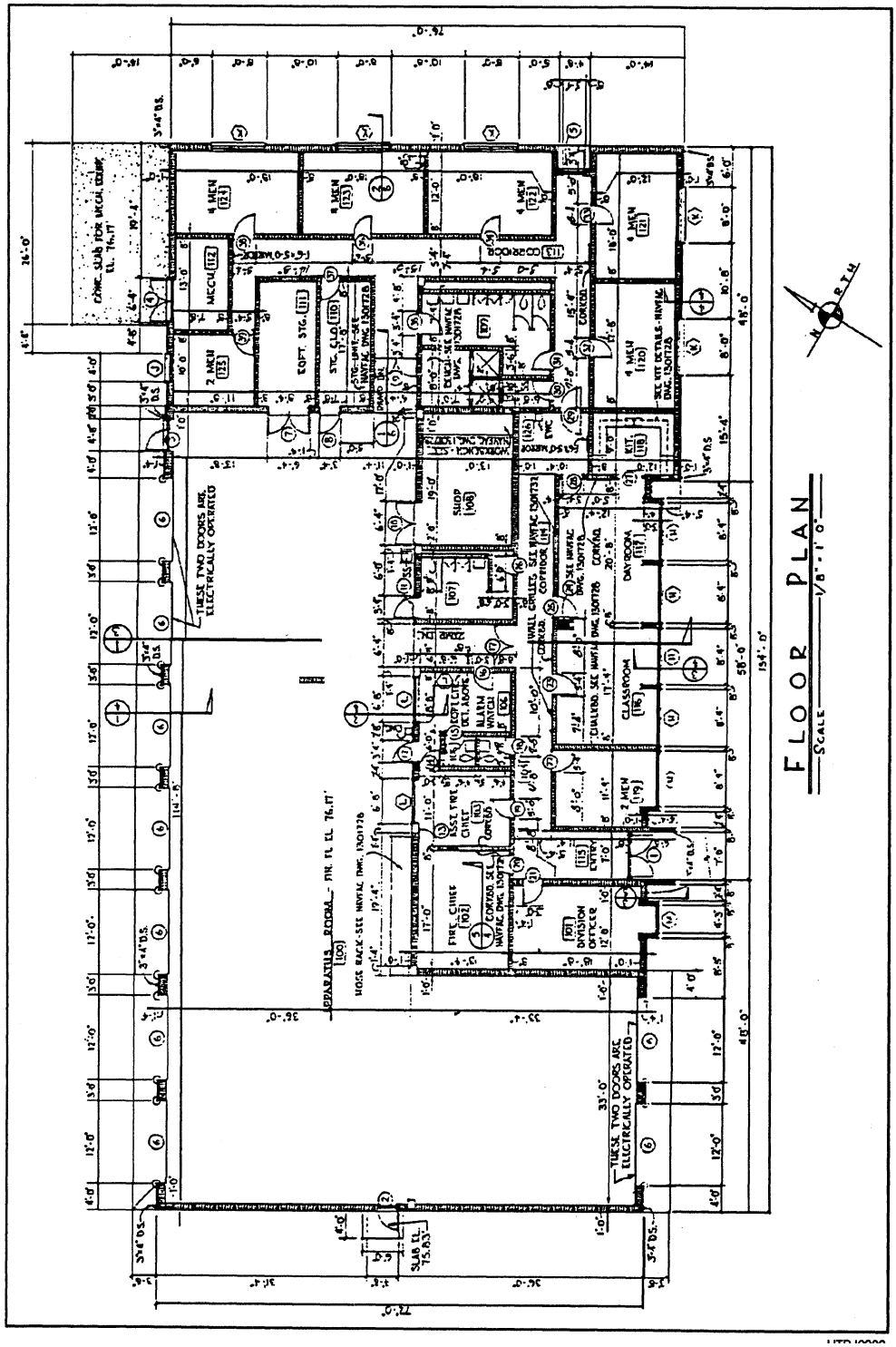

Figure 1-2.—Architectural or floor plan of concrete-masonry construction.

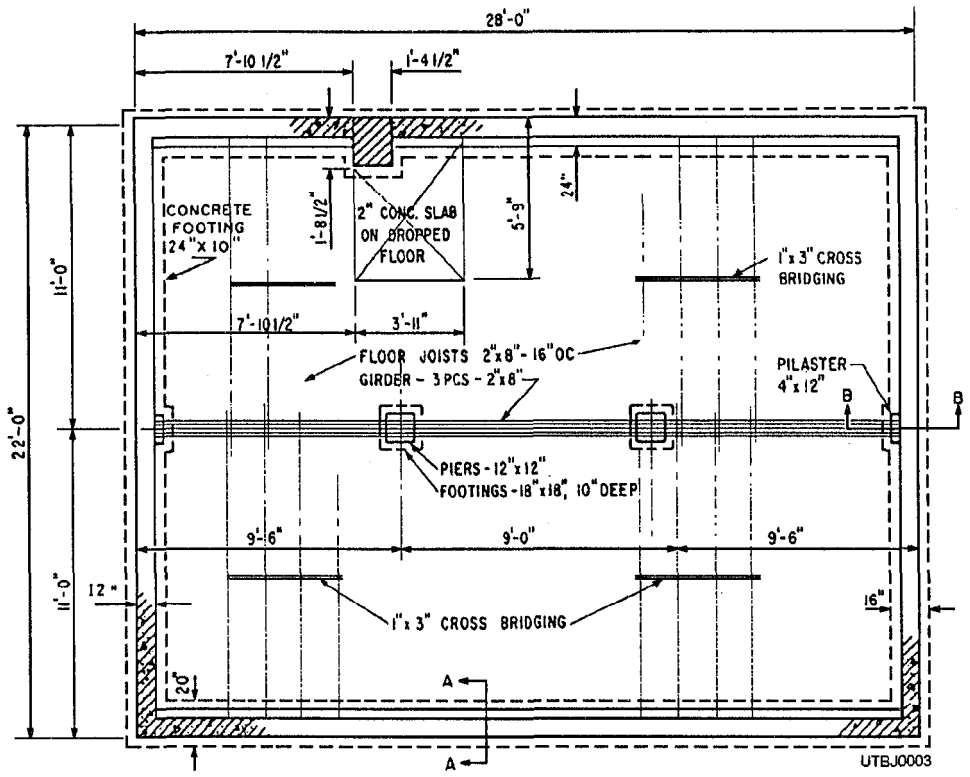

Figure 1-3.—Structural or foundation plan.

should work directly from the jobsite plans or working drawings, so the finished job is done properly and complies with the plans.

The chief parts of a mechanical plan are the views of the fixtures and equipment and the layout and details of the system. Plans also contain written information in the title block; the scales; the lines, symbols, and abbreviations; the print notes; the revision block; the drawing, reference, and zone numbers; and the bill of material. All of these areas are covered in detail in *Blueprint Reading and Sketching,* NAVEDTRA 12014.

Q1. In Seabee construction, a complete set of blueprints consists of how many plans?

Q2. The plans normally used by Seabees in construction are created by whom?

Q3. If you wanted to know the height of an exterior wall of a structure, to what section of *the plans should you refer?*

Q4. On the jobsite, you will work from what type of plans?

ISOMETRIC SKETCHING

LEARNING OBJECTIVE: *Recognize and develop isometric drawings.*

You may not be able to sketch or draw objects exactly as they should look or as a two-dimensional orthographic picture. However, with the aid of some basic rules and practice, you can learn to draw an isometric sketch.

PURPOSE OF THE ISOMETRIC DRAWING

The purpose of an isometric drawing is to show a three-dimensional picture in one drawing. It resembles a picture without the artistic details. Many Utilitiesmen have difficulty in visualizing a piping installation clearly when they are working from a floor plan to an elevation drawing and back again. The isometric drawing combines the floor plan and the elevation. It clearly shows the details and the relationship of the pipes in a piping installation.

Normally, isometric drawings are NOT drawn to scale on blueprints; however, when you sketch out an

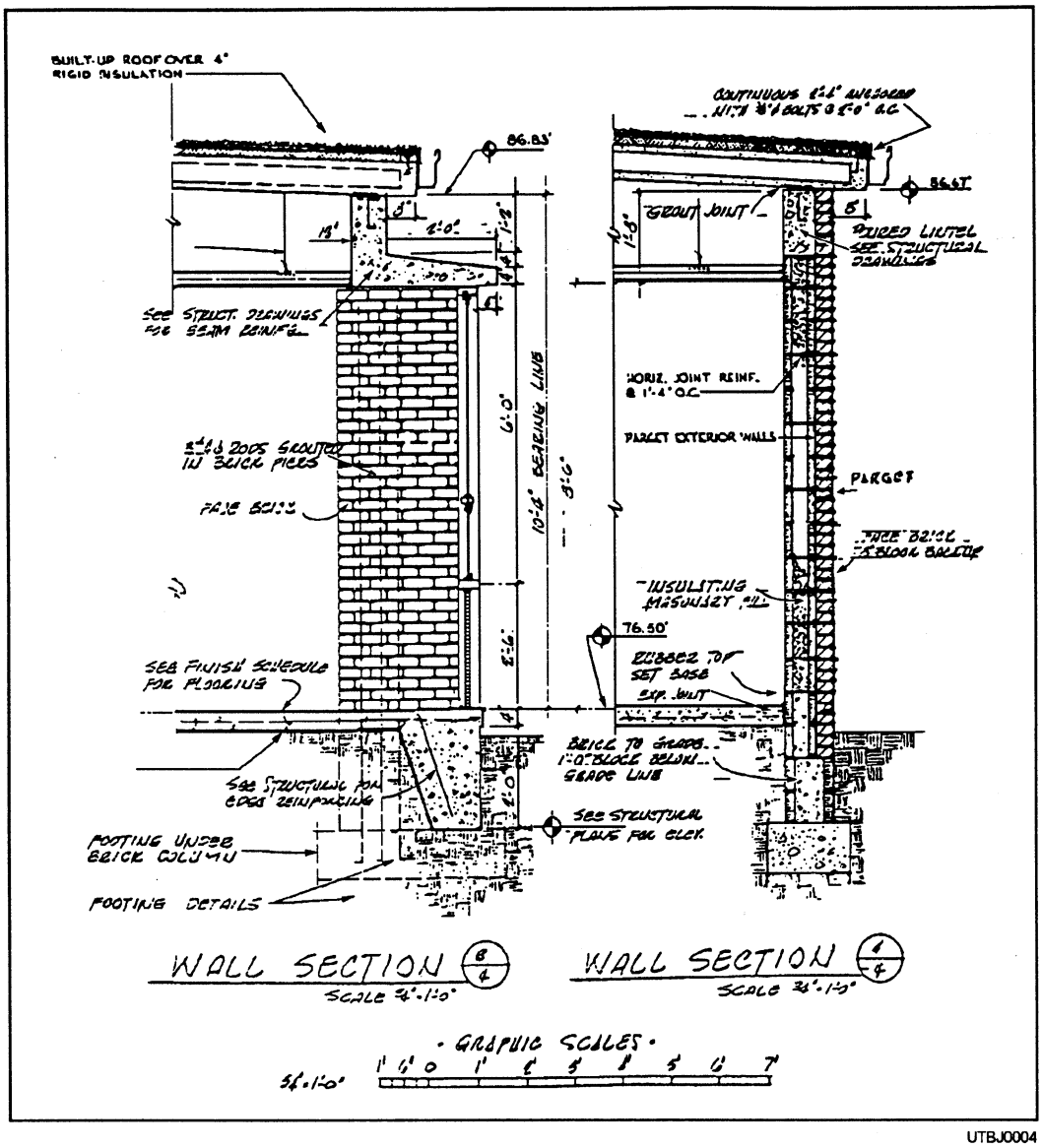

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Figure 1-4.—Structural plan wall sections.

isometric drawing, you have the option of drawing it to scale.

The isometric drawing follows certain rules or conventions to show three dimensions on a flat surface. These rules are as follows:

1. Vertical lines in an orthographic elevation remain vertical in an isometric sketch.

2. Horizontal lines in an orthographic elevation are projected at an angle of 30 degrees and 60 degrees in an isometric drawing.

COMPARISON OF ISOMETRIC AND ORTHOGRAPHIC DRAWINGS

Compare the simple rectangular block shown in the orthographic representation in view A, figure 1-7, and the three-dimensional-view isometric representation in view B. Notice that the vertical lines of the orthographic drawing and isometric drawing (views A and B) remain vertical. The horizontal lines of the orthographic drawing are NOT horizontal in the isometric drawing but are projected at 30-degree and 60. degree angles, and the length of the lines remain the same in the isometric as they were in the orthographic.

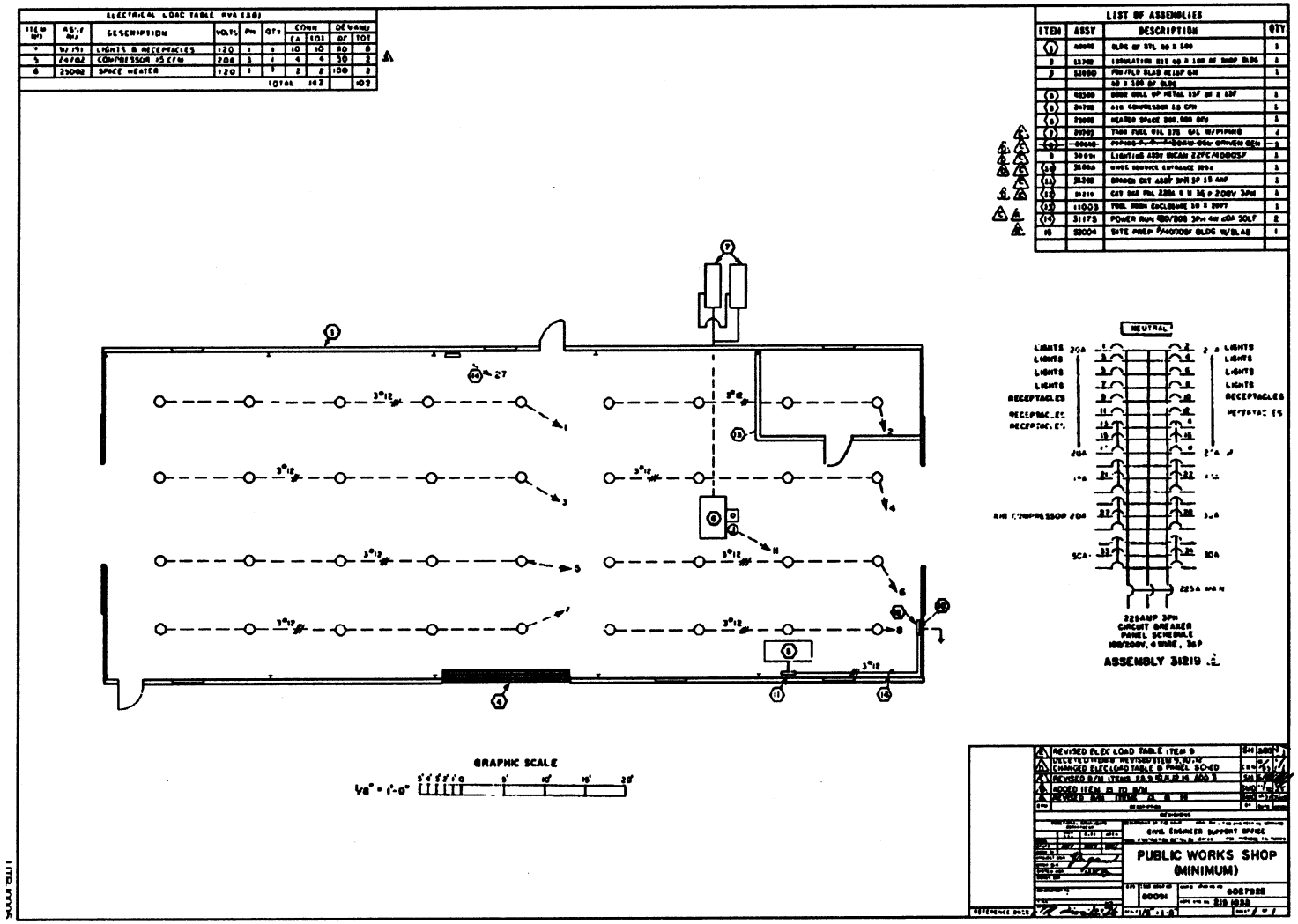

Figure 1-5.—Interior electrical plan.

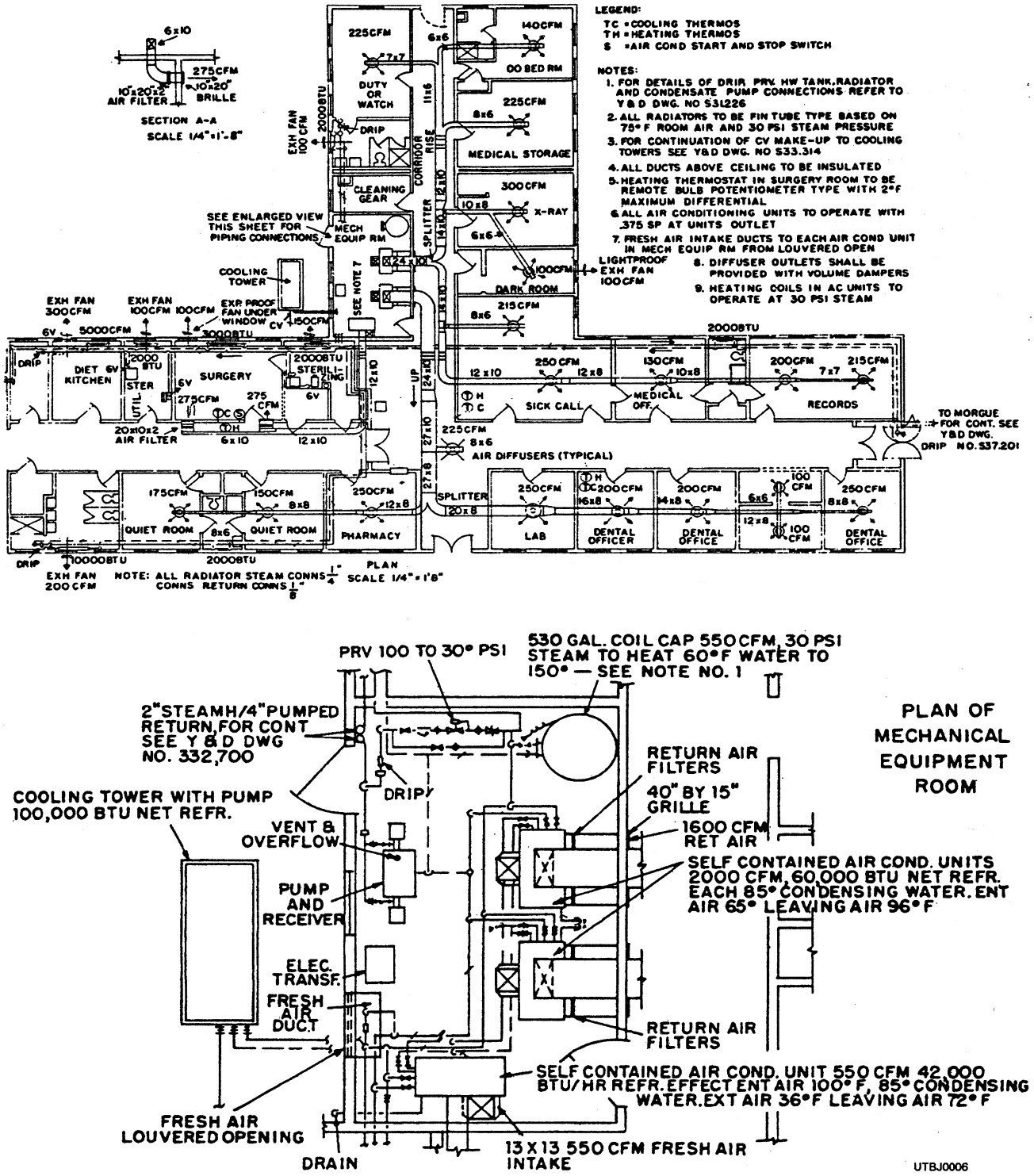

Figure 1-6.—Mechanical plan-air-conditioning system.

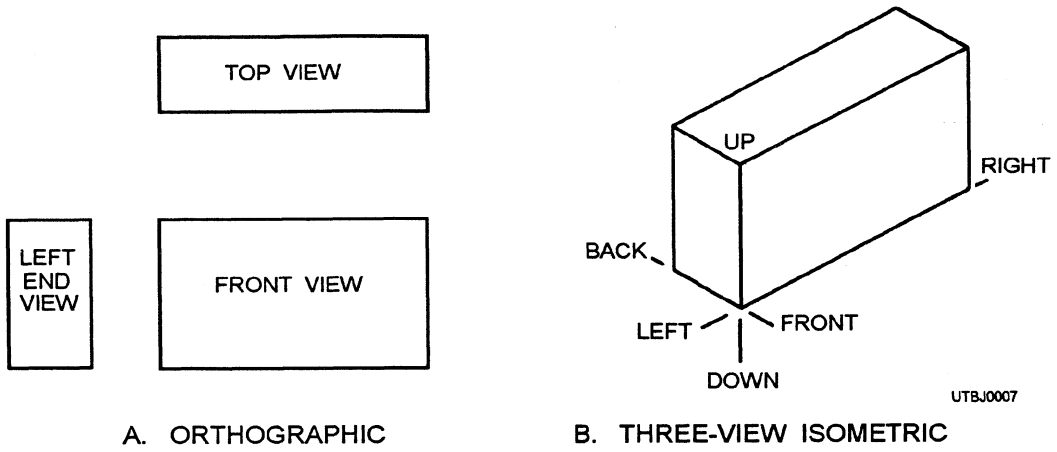

Figure 1-7.—Orthographic and isometric drawings.

Once you understand the drawing in figure 1-7, the same idea can be applied to the drawing of the shape of a room, as shown in figures 1-8 and 1-9.

DRAWING AN ISOMETRIC VIEW

To determine the pipe layout, you can draw the dimensions of a room in several ways. Some Engineering Aids suggest that the lines of the room be drawn with fine, light lines, and the pipe diagram with heavy, dark lines to give the effect of a transparent room you can see into, as shown in figure 1-10. This method requires drafting room equipment and is difficult in field sketching.

Another means of visualizing the pipe layout is to "section" or remove from the drawing those parts in front of what is important to show. The usual section in a plumbing pipe layout leaves the ceiling and two walls out of the drawing, as shown in view C of figure 1-10.

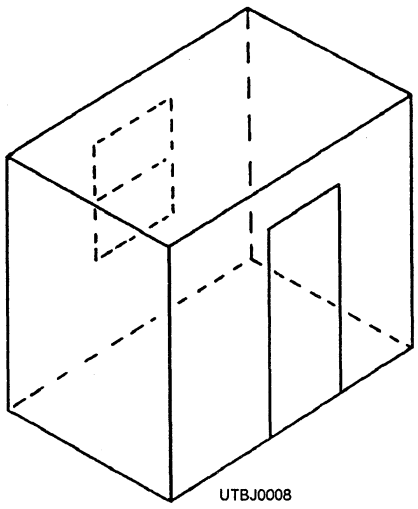

Figure 1-8.—Isometric drawing of a room.

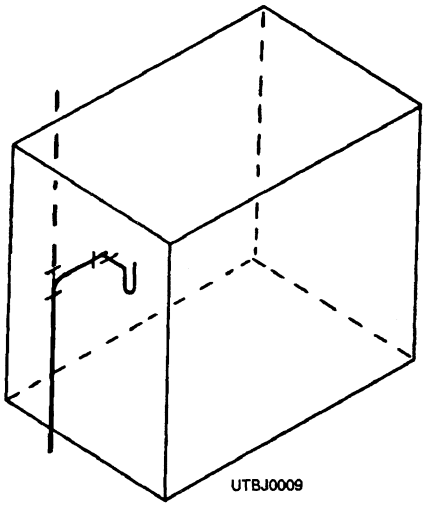

Figure 1-9.—Isometric drawing of a room and drainage pipe.

A third method is simpler in that the room is shown only as a partial floor plan view, as shown in view D, figure 1-10. The walls are omitted from the drawing entirely. It is understood that the walls are to be there, but they are left out so the piping diagram is' shown without unnecessary details.

To lay out a 45-degree angle in an isometric drawing, draw a square and lay out the 45-degree angle, as shown in view A, figure 1-11. Now look at view B and you will see a block with a 45-degree chamfer. The chamfer is located by measuring equal distances from the corner that would ordinarily be there.

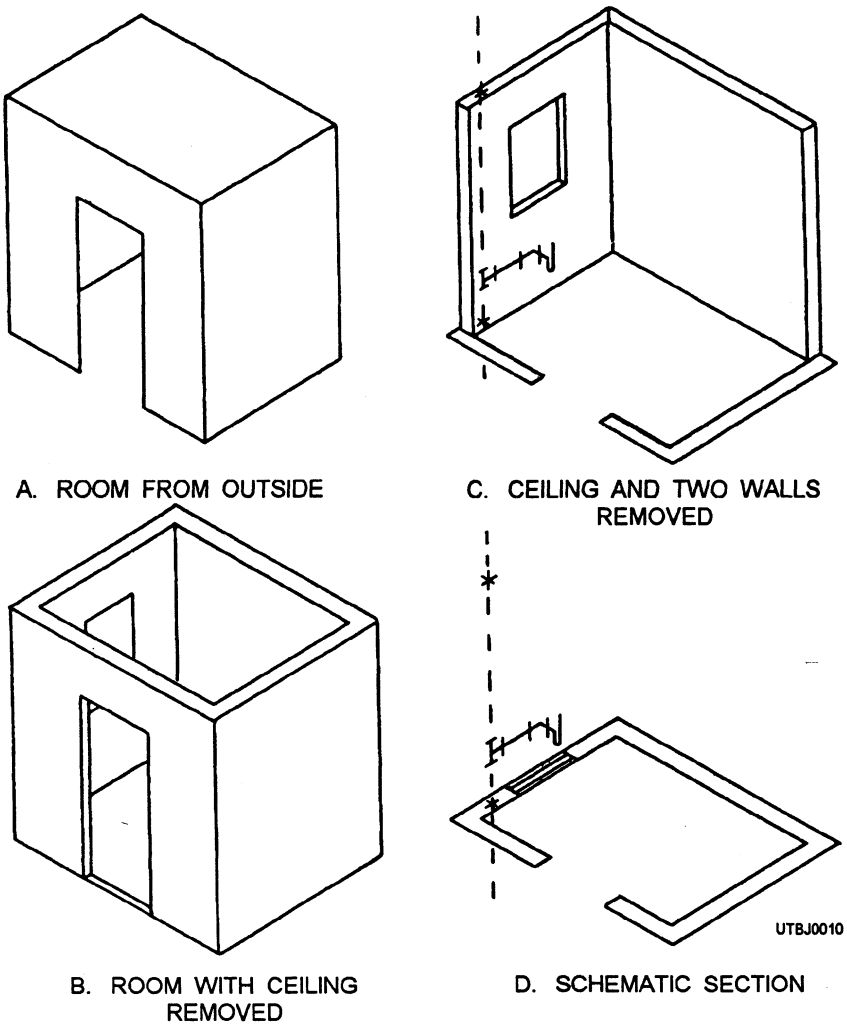

Figure 1-10.—Isometric plumbing pipe layout.

A piping diagram with a 45-degree angle, as shown in view C, would be very similar to the lines for part of the block, as shown in view B. To draw a 45-degree angle in an isometric drawing, begin with a 90-degree angle. Measure an equal distance from the intersection of the two legs connecting these points; then, establish two sides of a square. By connecting these points, you have established the diagonal, which is a 45-degree angle. In view C, point A would be the intersection of the two legs of a 90-degree angle, measured an equal distance along each leg; three fourths of an inch is used here. Now, locate points B and C. Connect points B and C, and you have established the 45-degree offset.

DIMENSIONING AN ISOMETRIC DRAWING

An isometric drawing, or sketch, is dimensioned with extension and dimension lines nearly like a two-dimensional drawing. The extension lines extend from the drawing, so the dimension lines are parallel to the object line and of equal length to it.

To dimension the isometric drawing is more difficult because there is only a single view, and less room is available than on three separate views. Figure 1-12 shows a dimensioned isometric drawing for part of a pipe hanger. In making the isometric pipe diagram, refer to the architect's plans and "rough in" sheets for accurate information.

Since pipe diagrams are measured from the center of one fitting to the center of the next fitting, it is possible to omit the extension and dimension lines by use of a notation, such as 13 inch c to c (center to center).

Pipe sizes must be added to the pipe diagram. The size of pipe is shown by a number near the line indicating the pipe, as shown in figure 1-13.

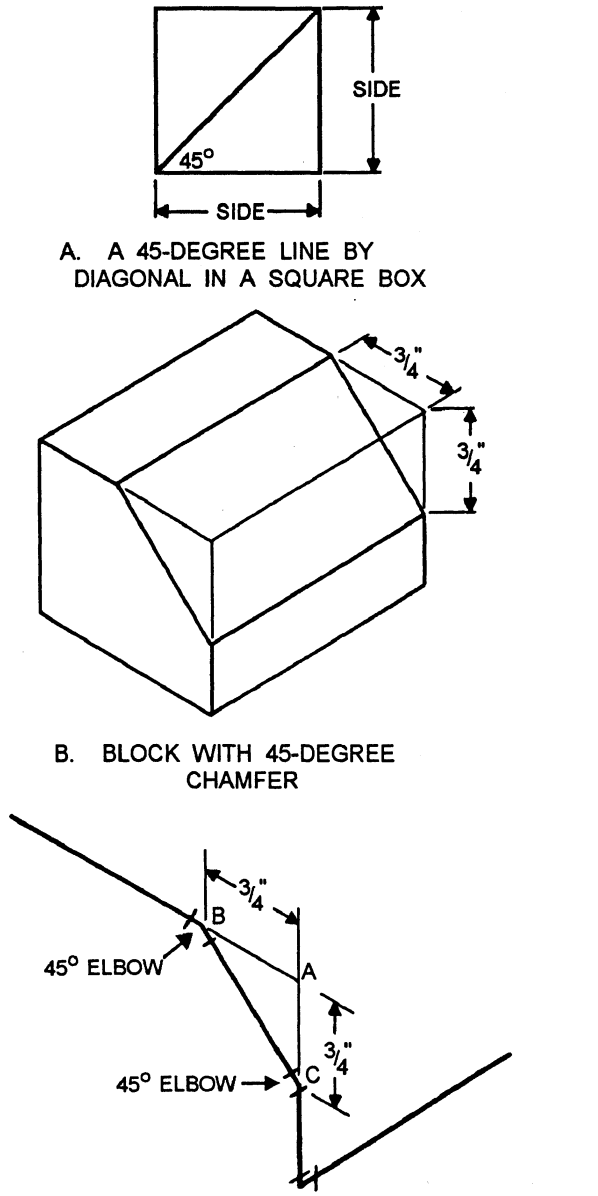

Figure 1-11.—Isometric 45-degree squares, chamfers, and diagonals.

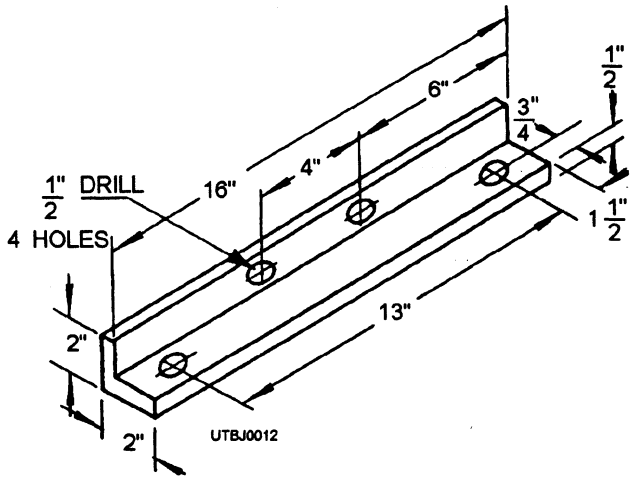

Figure 1-12.—Isometric drawing of a pipe hanger.

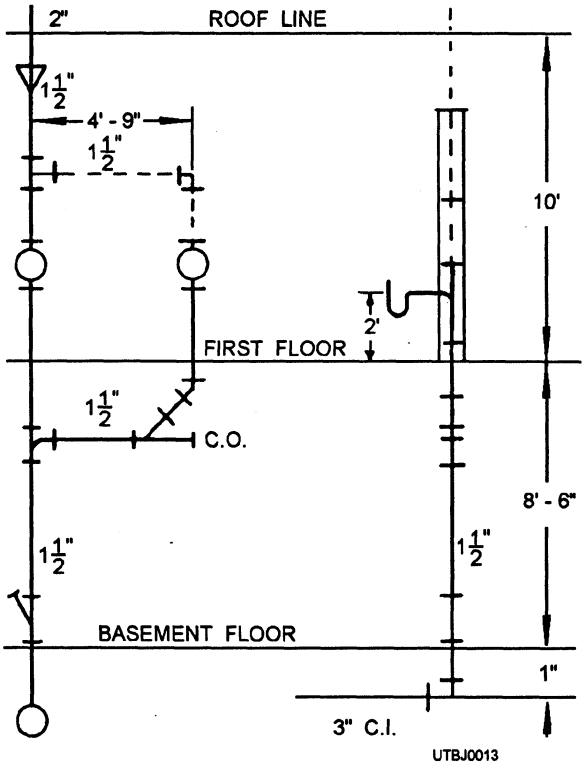

Figure 1-13.—Pipe layout.,

PLACING DIMENSIONS ON AN ISOMETRIC DRAWING

The purpose of an isometric pipe layout is best served by a simplified dimensioning system. Because few dimensions are shown, draw accurately to scale, so the layout can be measured.

Practice dimensioning by redrawing the pipe diagram of figure 1-13 as an isometric pipe layout. Ensure the lengths are to scale, and dimension the pipe size accordingly. Also, make a list of fittings and pipe required (MTO).

SKETCHING PRACTICE

So far, the principles of reading prints and drawing sketches have been discussed. To practice these rules, look at the three isometric drawings in figure 1-14 and sketch three, 3-view drawings, properly dimensioned

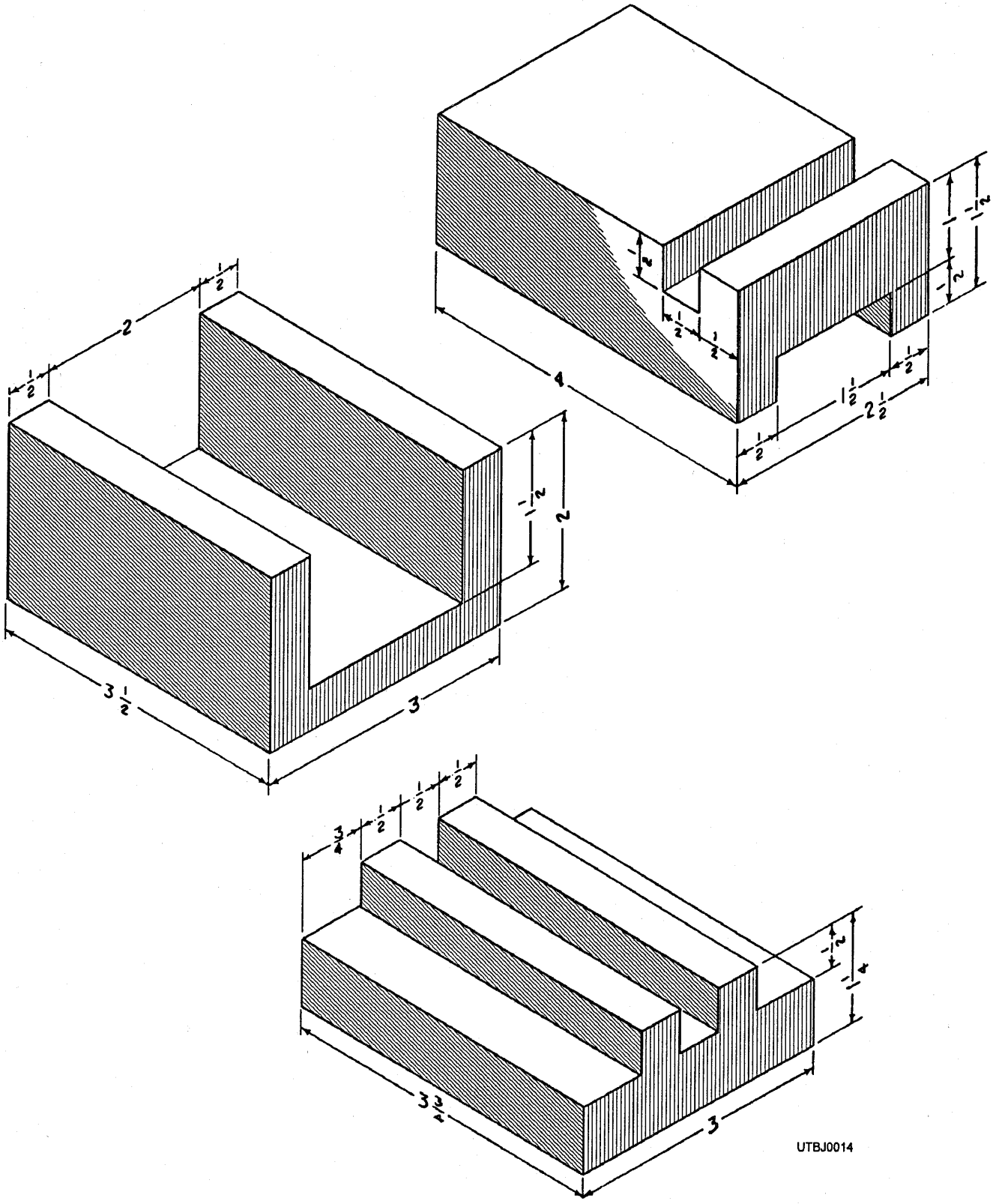

Figure 1-14.—Three isometric views to be drawn orthographically.

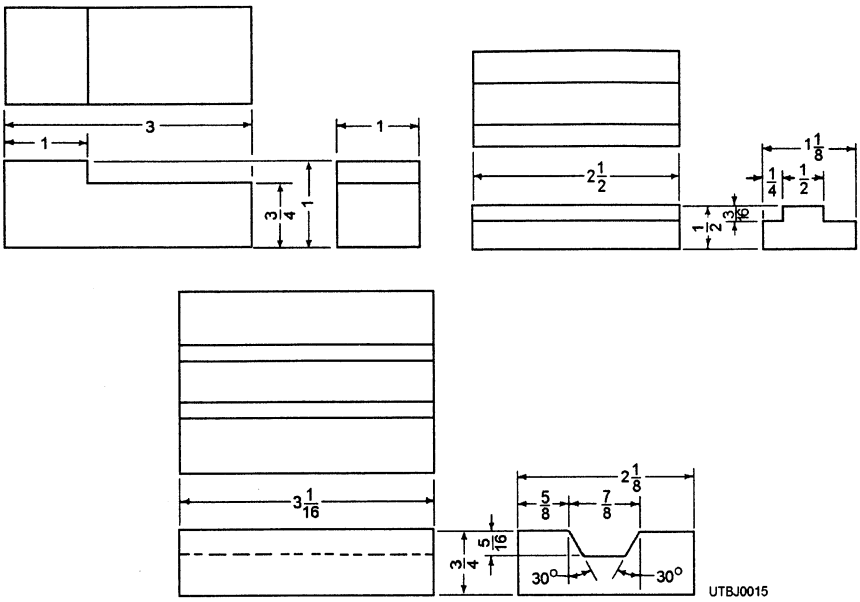

Figure 1-15.—Three orthographic views to be drawn isometrically.

(fig. 1-15). Now, make three isometric sketches properly dimensioned.

There is more information on drawing sketches in *Blueprint Reading and Sketching,* NAVEDTRA 12014.

Q5. An isometric drawing is designed to show what type of picture?

Q6. Horizontal lines on an isometric drawing are projected at what angles?

Q7. It is more difficult to dimension an isometric drawing than an orthographic drawingfor what reasons?

SPECIFICATIONS

LEARNING OBJECTIVE: *Relate to the arrangement and purpose of specifications and their relationship with plans and drawings.*

Although the plans you will be working from usually have sufficient detail, you will need additional information regarding materials and methods of installation. This information is located in the appropriate specifications. Plans and specifications go together to provide visual and written information about a project required by you, as the constructor, installer, or maintainer, to produce the best quality product.

There are several types of specifications **(SPECS),** but you will work primarily with project guide, federal, military, and NAVFAC specifications.

Project guide specifications usually begin with Division 1, the **GENERAL REQUIREMENTS** for the structure. They state the type of foundation, the character of load-bearing members (wood frame, steel frame, concrete), the type or types of doors and windows, the types of mechanical and electrical installations, and the principal function of the building. Next comes the **SPECIFIC CONDITIONS** that are carried out by the constructors. The conditions are grouped in divisions under headings applying to each major phase of construction as follows:

1. — **GENERAL REQUIREMENTS.**

2. — **SITE WORK.** Includes work performed on the site, such as grading, excavation, compaction, drainage, site utilities, and paving.

3. — **CONCRETE.** Includes precast and cast-in-place concrete, formwork, and concrete reinforcing.

4. — **MASONRY.** Includes concrete masonry units, brick, stone, and mortar.

5. — **METALS.** Includes such items as structural steel, open-web steel joists, metal stud and joist systems, ornamental metal work, grills, and louvers.

6. — **WOOD AND PLASTICS.** Includes wood and wood framing, rough and finish carpentry, foamed plastics, fiber-glass reinforced plastics, and laminated plastics.

7. — **THERMAL AND MOISTURE PROTECTION.** Includes such items as waterproofing, dampproofing, insulation, roofing materials, sheet metal and flashing, caulking, and sealants.

8. — **DOORS AND WINDOWS.** Includes doors, windows, finish hardware, glass and glazing, storefront systems, and similar items.

9. — **FINISHES.** Includes floor and wall coverings, painting, lathe, plaster, and tile.

10. — **SPECIALTIES.** Includes prefabricated products and devices, such as chalkboards, movable partitions, fire-fighting devices, flagpoles, signs, and similar items.

11. — **EQUIPMENT.** Includes such items as medical equipment, laboratory equipment, food service equipment, kitchen and bath cabinetwork, and counter tops.

12. — **FURNISHINGS.** Includes prefabricated cabinets, blinds, drapery, carpeting, furniture, and seating.

13. — **SPECIAL CONSTRUCTION.** Includes prefabricated structures, integrated ceiling systems, and swimming pools.

14. — **CONVEYING SYSTEMS.** Includes dumbwaiters, elevators, moving stairs, material-handling systems, and other similar conveying systems.

15. — **MECHANICAL.** Includes plumbing, heating, air conditioning, fire-protection systems, and refrigeration systems.

16. — **ELECTRICAL.** Includes electrical service and distribution systems, electrical power equipment, electric heating and cooling systems, lighting, telephone systems, and other electrical items.

17. — **EXPEDITIONARY STRUCTURES.** Include tension fabric structures, K-span buildings, and other similar items.

Not all of the specification divisions are required for every construction project. Divisions that are not required for a construction project are normally omitted. Sections under one of these general categories generally begin with **GENERAL REQUIREMENTS** for that category and continue with the **SPECIFIC REQUIREMENTS.** An example of a section of Division 15 **(MECHANICAL)** follows.

In studying the guide specifications for plumbing which follow, study the drawing shown in figure 1-16, keeping in mind that these specifications are for this project and are listed as samples.

DIVISION 15. **MECHANICAL**

Section 15. 1a- Plumbing

15. 1a-01. **GENERAL REQUIREMENTS.** The work consists of a complete plumbing system, including the sanitary soil, waste, and vent piping; cold- and hot-water supply piping, water meter (if required), plumbing fixtures, hot-water heater, and other appurtenances. The system must be inspected, tested, and approved by local governing plumbing codes before burying, concealing, or covering the various piping systems. Each system must be complete and ready for operation except as specified or indicated otherwise.

15. 1a-02. **SANITARY SEWER, BELOW-GROUND** level, must be of extra-heavy cast-iron soil piping and fittings of the bell-and-spigot type, extending 3 to 5 feet beyond the foundation wall and graded not less than 1/8 inch per foot. The joint will be made from a good grade of twisted oakum uniformly and well-tamped into the joint and with a l-inch depth of hot poured lead, made in one pouring, and caulked tight. All horizontal soil connections to the system must be accomplished by Y-fittings or combination Y and 1/8 bends. All changes in direction greater than a 1/8 bend must be of the long sweep pattern. Lines

should be well-supported to eliminate sagging. Backfilling will be well-tamped in (i-inch layers.

15. 1a-03. **SANITARY SEWER, ABOVE-GROUND** level, must be as specified for the belowground level, except waste lines and vent piping above the ground must be of zinc-coated, standard-weight, screwed-end steel pipe and cast iron, recessed, long radius, screwed drainage fittings, and graded not less than 1/8 inch per foot. The sanitary sewer vent will extend full size through the roof for a distance of not less than 12 inches, where it must be flashed with suitable corrosion-resistant metal before the roofing is installed. A 4-inch cleanout will be provided slightly above the ground elevation at the base of the soil stack. All male screw ends will be coated with a good grade pipe joint compound before entering into fittings. The bathtub trap must be provided with a 3/4-inch brass, screw dram plug; all lines must be properly supported from the floor joists with suitable hangers. A closet-bowl floor connection must have a cast-iron closet-bowl floor flange with provisions for anchoring the brass closet-bowl bolts and an approved type of horn gasket. The finished joint must be absolutely leakproof, and the bowl will sit squarely on the finished floor.

15. 1a-04. **WATER PIPING BURIED IN THE GROUND** must be jointless, type "K," soft copper tubing. No kinking of the tube will be allowed.

15. 1a-05 **WATER PIPING ABOVEGROUND** level must be type "L," hard copper tubing with solder-type fittings, except that vertical lines may be of type "L," soft copper tubing. All tubing lines will be properly anchored to the floor joists to eliminate pipe sag and vibration and pitched to the main shutoff valve for draining, when necessary. A hose bib will be provided at the rear of the building with a stop and waste located inside the foundation wall for winter cutoff and waste and arranged for complete drainage of the line from the hose bib. Slip-joint connections will not be permitted below the finished floor.

15. 1a-06. Fixtures must be of a reliable manufacturer and will be as follows:

(a) The **KITCHEN SINKS** will have a left-hand drainboard and be of cast iron with a smooth, white, acid-resisting porcelain enamel finish, 54 inches long by 25 inches wide by 35 inches high from floor to top of rim. The trim will be chromium plated, including combination mixing faucets with a soap dish, a large basket-type strainer with a 1 1/2-inch tailpiece, and a 1 1/2-inch wall-type P-trap. Hot- and cold-water supply lines in the sink cabinet will be provided with copper tubing valves. The cabinet will be of a heavy gauge steel with a baked-on, white enamel finish and have at least two sliding drawers.

(b) The **LAUNDRY TRAY** will be of the double compartment, cement type, 48 inches long by 20 inches wide by 32 inches high from floor to rim and be of a smooth cement mixture to withstand sudden temperature changes without cracking or leaking. Tubs will have a metal guard around the rim. The laundry tray will be complete with stand, combination mixing faucets with tray-mounting brackets, 1 1/2-inch tailpiece, and 1 1/2-inch wall-type P-trap. A copper tubing valve will be provided in each supply line.

(c) The **WATER CLOSET** will be of white, vitreous china, close-coupled tank and bowl, complete with white seat and seat cover, and have a chromium, 3/8-inch, screwed, brass floor supply line with a chromium I.P valve.

(d) The **LAVATORY** will be cast iron with a white porcelain enamel finish. The trim will be chromium plated and include combination mixing faucets with a 1 1/4-inch tailpiece, pop-up waste, 1 1/4-inch wall trap, and 3/8=inch, screwed, brass floor supply lines with I.P. valves.

(e) The **TUB** will be of the built-in type, cast iron, with a white porcelain enamel finish. The trim will be chromium plated and include a built-in wall-type faucet complete with shower attachments, a curtain rod and pins, and a 1 1/2=inch trip-lever waste. Copper tubing valves will be provided on each supply inside the wall access door.

15. 1a-07. **WATER HEATER** must be of the electrical storage type with a capacity of not less than 52 gallons. It must be of an approved manufacturer with the underwriter's label attached. It will be provided with two thermostatically operated heating elements: a 15-kilowatt element located near the top of the tank and l-kilowatt element located near the bottom of the tank. A 3/4-inch bronze drain valve will be provided at the extreme bottom of the tank with a 3/4-inch hose connection. A l/2-inch brass, combination temperature and pressure-relief valve with a discharge extending to the floor drain will be furnished. A copper tubing valve will be installed in

the cold-water supply. Electrical work must conform to the local governing electrical codes.

15. 1a-08. A main **SHUTOFF VALVE** will be installed as indicated or specified. The 1-inch main shutoff valve must be accessible to the stop-and-waste valve with solder-type ends, and the waste arranged for complete drainage of the entire water-supply system.

15. 1a-09. **WORKMANSHIP** will be performed in a fast-class manner, observing all standards of good installation practices.

15. 1a-10. **TESTS** must be conducted on all plumbing systems to provide tightness of all piping joints. If leaks occur, they will be repaired immediately and the tests repeated. The soil, waste, and vent systems will be completely filled with water to the highest point before checking for leaks. The hot- and cold-water piping must be tested with water at 1 1/2 times the working pressure. After all tests have proved satisfactory, all the necessary adjustments on the faucets, traps, valves, and other specialties will be checked, so the entire system can be placed in normal operation.

15. 1a-11. **INSULATION.** All the piping and fittings subjected to freezing temperatures must be adequately insulated with a suitable frostproof covering secured in place.

The project guide specifications, then, provide all the required information on the materials and methods of work to be used in completing a project that is not contained in the plans. There may be times when you will need to know more about the characteristics of materials listed in the bill of material. For example, if you cannot obtain a specified type of material or piece of equipment and want to substitute, you will need to know the characteristics of each in order to compare them before making the decision to substitute. This is where a knowledge of and access to federal, military, and NAVFAC specifications are important.

FEDERAL specifications are written technical descriptions of materials and supplies used by the Navy and other federal government agencies. They cover in detail the characteristics and compositions of these items and are listed, along with military specifications, in numerical and alphabetical indices generally available to you.

MILITARY specifications are similar to federal specifications but are developed for use by the Department of Defense. Formerly called JAN (Joint Army and Navy) specifications, they have been revised to MIL-SPECS, using the same serial number as before.

The last of the specifications that you will most likely use is the **NAVFAC** specifications. These are developed by the Naval Facilities Engineering Command and cover the Naval Facilities Engineering Command and other items normally used for construction. They are listed as "Type Specs" and Standard Specifications in the *Service Contracts Specifications,* NAVFAC MO-327.

Q8. Are all specification divisions required for every construction project?

Q9. You are installing a dental operatory chair on a project. To what division of the specifications should you refer?

Q10. In the specifications sample "Division 15 Mechanical," what paragraph identifies the type of pipe for aboveground, vertical waterlines?

Q11. When is it necessary to know specific characteristics of a part or material?

ASSIGNMENT AS A CREW LEADER

LEARNING OBJECTIVE: *Identify the basic fundamentals of project planning, organization, and supervision.*

As you gain experience in utilities work, you will probably be called upon to serve as the leader of one or more crews. They may perform various types of work, such as measure, cut, and thread pipe; install pipe lagging and other insulation and protective materials on pipe; or other related utilities type work. Your duties, as a crew leader, may vary from one activity to another. Usually, these duties involve planning work assignments, supervising work teams, preparing requisitions, and keeping time cards.

PLANNING WORK ASSIGNMENTS

Planning is the process of determining requirements and devising and developing methods and schemes of action for construction of a project. Proper planning saves time and money for the Navy and makes the project easier for everyone concerned. Here are some pointers that are designed to help you plan day-to-day work assignments for your crew(s).

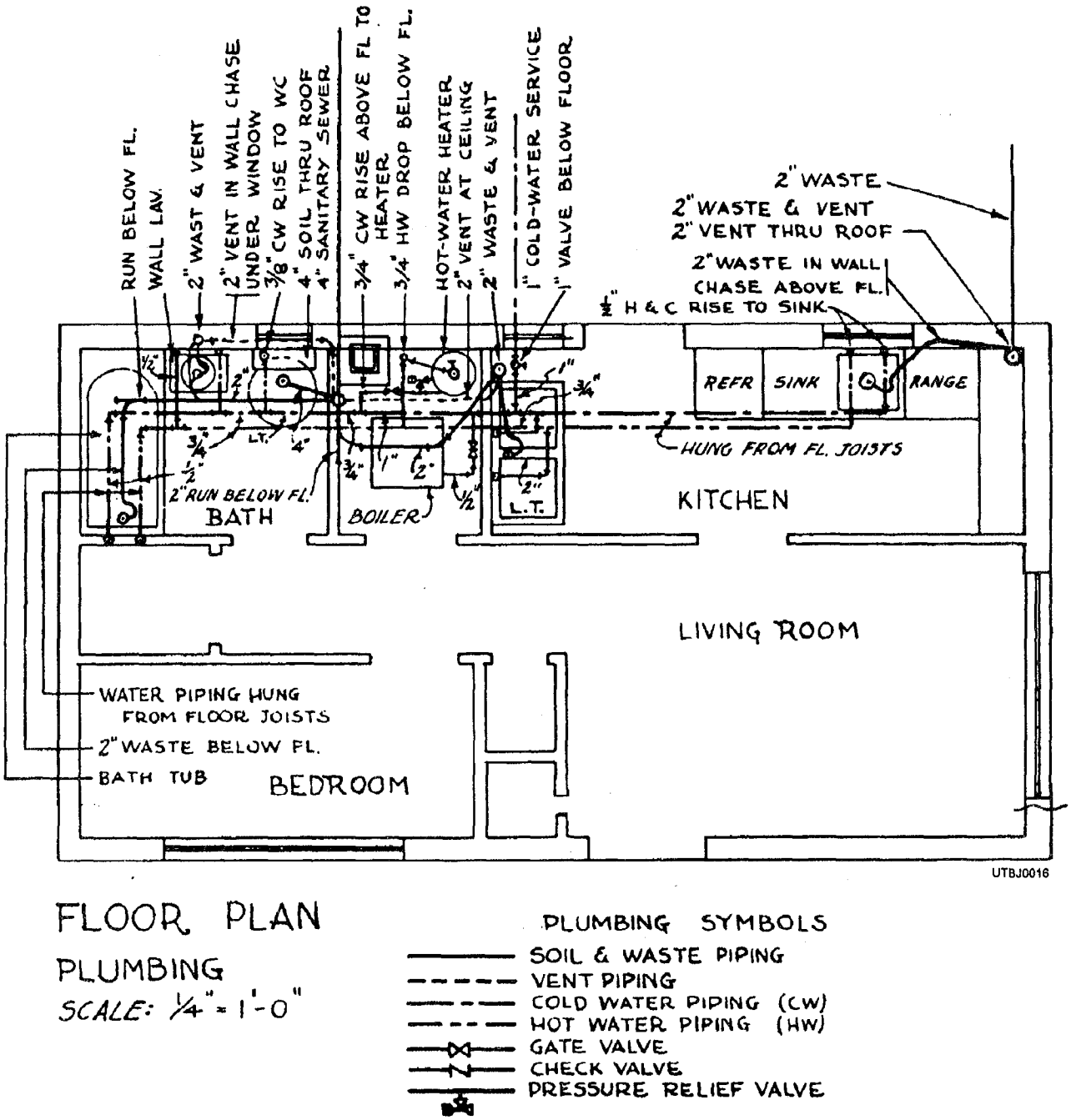

Figure 1-16.—Typical plumbing layout for a small house.

When you are assigned a job, whether in writing or orally, one of the first things to do is to make sure you understand clearly just what is to be done. Study plans and specifications where applicable. If you have any questions, find out the answers from those in a position to supply the information you need. Among other things, make sure you understand the priority of the project, time of completion, and any special instructions to be followed.

In planning for a small or a large project, you must consider the capability of the personnel available for assignment. Determine who is to do what and how long it should take to complete the job. Realizing that idleness may breed discontent, arrange to have another job ready for starting as soon as the first one is finished.

Establish goals for each workday and encourage your crew to work together as a team in accomplishing these goals. You want goals to be such that your crew is

kept busy, but make sure they are **realistic.** During an emergency, most people will make a tremendous effort to meet a deadline. But people are not machines, and when there is no emergency, they cannot be expected to achieve an excessively high rate of production continually.

In planning, you must also allow for things that are not considered direct labor, such as safety training, disaster control training, leave, and liberty.

To help ensure that a job is done properly and on time, you should consider the method to use in doing the job. If there is more then one way, make sure the method you select is the best. After selecting a method, analyze it to see if it could be simplified and still save time and effort.

Plan material requirements so you will not have a lot of leftover materials. But do not make material estimates so low that you might run out of necessary items and cause the job to be delayed. At times, you may have to use more materials than anticipated, so it is better to have some leftover materials than to run short.

Consider the tools and equipment you need for the job and arrange to have them available at the place where the work is to be done and at the time the work is to get under way. Determine who is to use the tools, and make sure these individuals to whom they are assigned know how to use them properly and safely. Determine whether special permits are required to operate special tools. Plan to have the materials in an accessible place that will not pose a safety hazard.

SUPERVISING WORK TEAMS

After the job has been planned properly, it is necessary to supervise the job carefully to ensure it is completed properly and on time. Some pointers for supervising work teams are provided below.

Before starting a job, make sure your crew members know what is to be done. Give instructions clearly, and urge them to ask questions on any points that are unclear. If they do not understand the requirements, they will be unable to do their job properly. It is also important to ensure the crew members know all pertinent safety precautions and wear safety apparel as required. Check all tools and equipment before use to ensure they are in a safe condition. Ensure electrical tools are marked with the current safety color code. The color code for any given month will be uniform for a 30-day period or less, according to COMSECOND/COMTHIRDNCBINST 5100.1. Ensure all electrical power tools are protected by GROUND FAULT INTERRUPTER (GFI) before use. Do not permit dangerously defective tools and equipment to be used; see that they are turned in for repair immediately. A job can be done without a specific tool by substitution, but people are not as expendable.

During construction, check from time to time to ensure the work is progressing satisfactorily. Determine if the proper methods, materials, tools, and equipment are being used. If one of your crew members is doing a job incorrectly, stop and point out what is wrong. Then explain the correct procedure and check to see that it is done. In checking the work of your crew, make sure they know that the purpose of your inspection is to teach, guide, and direct, rather than to criticize and determine fault. Ask questions to show interest, and praise good, sound ideas and judgment.

When time permits, rotate the crew members on various jobs. Rotation gives them varied experience and helps to ensure that you will have a person who can do the work if someone is hospitalized, transferred, or goes on leave.

A good supervisor should be able to get others to work together in getting the job accomplished., The supervisor should maintain an approachable attitude toward the crew, making members feel free to come and seek advice when they are in doubt as to any phase of the project. Emotional balance is especially important; a supervisor cannot become panicky in front of the crew. A good supervisor should use tact and courtesy in dealing with members of the crew and not show partiality to certain members. The supervisor should keep crew members informed on matters that affect them personally or concern their work. The supervisor should also seek to maintain a high level of morale, keeping in mind that low morale can have a definite effect upon the quantity and quality of work being turned out by the crew.

The information above is only a brief treatment on the subject of supervision. As you advance in rate, you will be spending more and more of your time supervising others, so make a continuing effort to learn more about the subject of supervision. Study books on supervision, as well as leadership. Also, read articles on topics of concern to supervisors, such as safety, training, job planning, and so forth, that appear from time to time in trade journals and other publications. Additional planning and estimating can be located in *the NMCB Crew Leader's Handbook* and the *Seabee*

iPlanner's and Estimator's Handbook, NAVFAC P-405. There is a big need in the Navy for petty officers who are skilled supervisors. Consider the role of supervisor as a big challenge and endeavor to become proficient in all areas of the supervisor's job.

Q12. What are the two benefits for the Navy when a project is planned properly?

Q13. As a supervisor, what is the first thing you should do once planning is complete?

COLORS FOR SAFETY

LEARNING OBJECTIVE: *Recognize piping, gas cylinders, and general safety color coding.*

Color warnings provide for marking physical hazards, for indicating the location of safety equipment, and for identifying fire and other protective equipment. As a Utilitiesman, you may often be concerned with uniform colors used for marking pipelines carrying hazardous materials, compressed gas cylinders, and fire- protection equipment.

CLASSES OF MATERIALS AND THEIR COLOR CODES

Five classes of materials have been selected to represent the general hazards for all dangerous materials, while a sixth class has been reserved for fire-protection materials. A standard color represents each of these classes, as shown in table 1-1.

In some instances, piping systems that do not require warning colors may be painted to match surroundings; in other instances, such systems may be painted aluminum, black, or remain unpainted.

MARKING PIPING SYSTEMS

In addition to color warnings, **WRITTEN TITLES** should be used to identify hazardous or dangerous materials conveyed in piping systems.

Table 1-1.—Warning Colors

Class	Standard Color	Class of Material
a	Yellow, number 13655	FLAMMABLE MATERIALS. All materials known ordinarily as flammables or combustibles. Of the chromatic colors, yellow has the highest coefficient of reflection under white light and can be recognized under the poorest conditions of illumination.
b	Brown, number 10080	TOXIC AND POISONOUS MATERIALS. All materials extremely hazardous to life or health under normal conditions as toxics or poisons.
c	Blue, number 15102	ANESTHETICS AND HARMFUL MATERIALS. All materials productive of anesthetic vapors and all liquid chemicals and compounds hazardous to life and property but not normally productive of dangerous quantities of fumes or vapors.
d	Green, No 14260	OXIDIZING MATERIALS. All materials which readily furnish oxygen for combustion and fire producers which react explosively or with the evolution of heat in contact with many other materials.
e	Gray, number 16187	PHYSICALLY DANGEROUS MATERIALS. All materials not dangerous in themselves, which are asphyxiating inconfined areas or which are generally handled in a dangerous physical state of pressure or temperature.
f	Red, No. 11105	FIRE PROTECTION MATERIALS. All materials provided inpiping systems or in compressed-gas cylinders exclusively for use in fire protection.

Titles should be stenciled or lettered on pipe (or covering) where the view is unobstructed, such as on the lower quarters. Lettering in this position is unlikely to be obscured by dust collection or mechanical damage. Titles should be in black or white ONLY and be clearly visible from operating positions, especially those next to control valves.

Use stencils with standard-size letters, as shown in table 1-2. For pipelines smaller than three quarters of an inch in diameter, use securely fastened metal tags with lettering etched or filled in with enamel. Apply titles with uppercase letters and Arabic numerals whenever applicable.

PRIMARY COLOR WARNINGS should be a single color, applied as a BAND (or BANDS), that completely encircle(s) the piping system. They are located on the piping system immediately next to all operating accessories, such as valves, regulators, strainers, and vents. The bands should be painted throughout the system at convenient intervals where branch lines join the system, where the system passes underground or through walls, and at any other conspicuous place where warnings are required. All piping and covering of an entire system, excluding straps, hangers, and supports, may be painted with the primary color warning. When this is done, DO NOT paint color bands of any kind on the system.

A colored ARROW should be used next to each primary color warning applied to a piping system to indicate the normal direction of flow of the material in the system. A double-headed arrow is used on lines subject to reverse flow. The color of arrows can be the same as the primary warning when bands are used—black or white. (Refer to fig. 1-17 for identification of piping systems.)

Table 1-2.—Size of Stencil Letters

Outside diameter of pipe or covering	Size of Stencil Letters
Inches	Inches
Under 1 ½	1/2
1 ½ to 3 ½	3/4
3 ½ to 6	1 1/4
6 to 9	2
9 to 13	3
Over 13	3 ½

MARKING COMPRESSED GAS CYLINDERS

Compressed gas cylinders used throughout the Department of Defense are of a standard color code. The material within is shown by a written title in two locations diametrically opposite and parallel to the longitudinal axis of the cylinder. Cylinders having a background color of yellow, orange, or buff have the title painted black. Cylinders having a background color of red, brown, black, blue, gray, or green have the title painted white.

A primary color warning relates to the primary hazard of the material. These colors appear as a circular band on piping systems and as main body, top, or band colors on compressed gas cylinders.

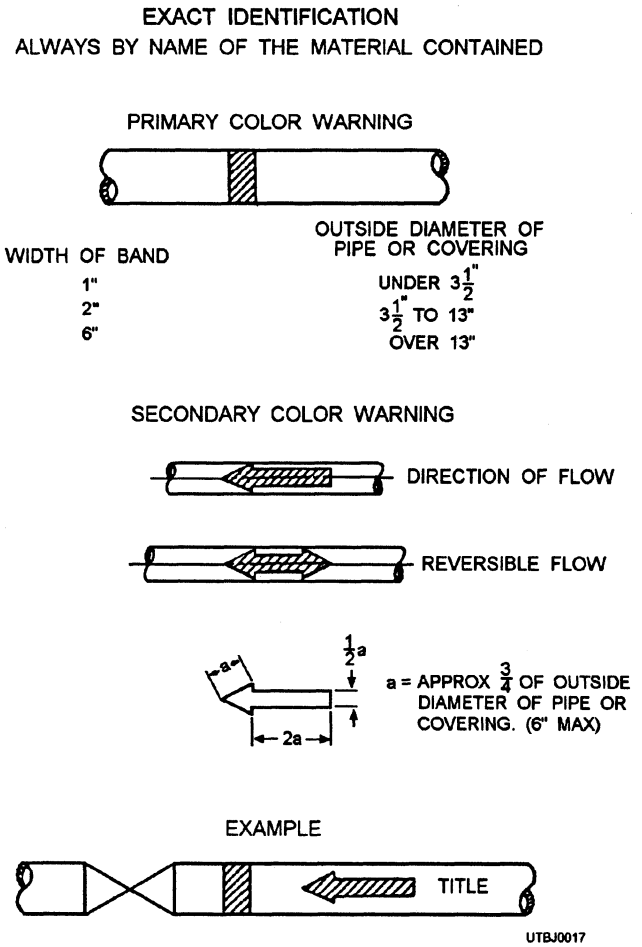

Figure 1-17.—Identification of piping system.

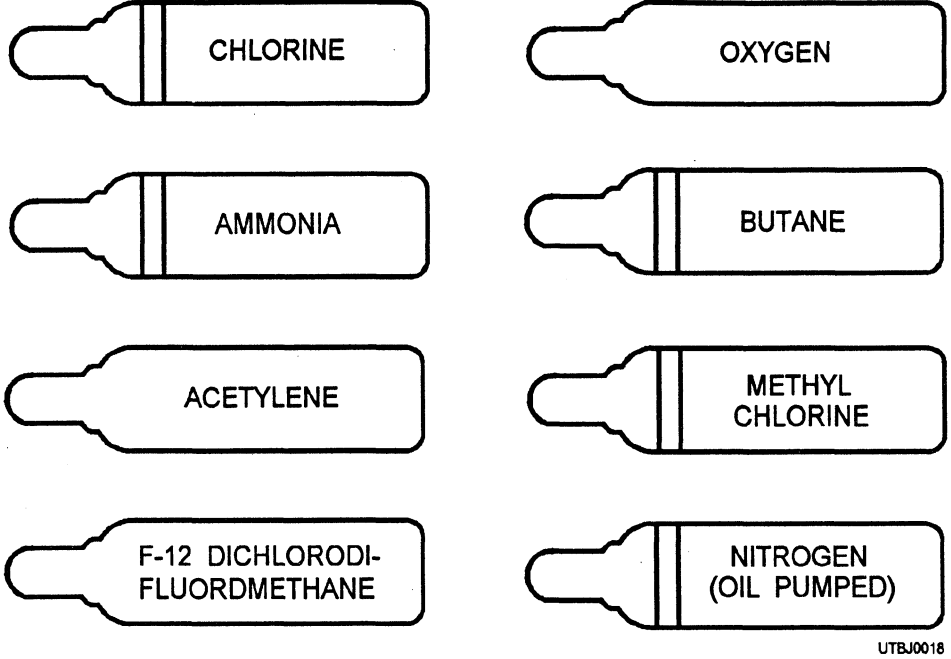

Figure 1-18.—Compressed gas cylinders commonly used by Utilitiesmen.

Table 1-3.—Cylinder Color Chart

Type Cylinders	Top Color	Band Color	Main Body Color
Chlorine	Entire	Cylinder	Brown
Ammonia	Brown	Yellow	Orange
Acetylene	Entire	Cylinder	Yellow
F-12 Dichlorodifluoromethane	Entire	Cylinder	Orange
Oxygen	Entire	Cylinder	Green
Butane	Yellow	Orange	Yellow
Methyl Chlorine	Yellow	Brown	Orange

A secondary color warning alerts you to the secondary hazard of a material. The second hazard differs from the primary hazard. These colors appear as arrows (or triangles) on piping systems and as main body, top, or band colors on compressed gas cylinders.

Two decalcomanias may be applied on the shoulder of each cylinder diametrically opposite at right angles to the titles. They should indicate the name of the gas, precautions for handling, and use. A background color corresponding to the primary color warning of the content should be used.

A shatterproof cylinder must be stenciled with the phrase "Non-Shat" longitudinally at 90 degrees from the title. Letters must be black or white and approximately 1 inch in size.

On cylinders owned by or procured for the Department of Defense, the bottom and the lower portion of the cylinder body opposite the valve end may be used for service ownership titles.

The appearance on the body, top, or as a band of any of the six colors listed in table 1-1 warns of danger from the hazards in handling the type of material contained in the cylinder.

Figure 1-18 shows compressed gas cylinders and table 1-3 shows cylinder colors most commonly found in a Naval Mobile Construction Battalion or in a Public Works Department where Seabee personnel will be

working. For a complete listing of compressed gas cylinders, refer to MIL-STD-101B; but make sure you have a standard with the latest up-to-date changes inserted, as changes may occur in the manual as prescribed by the Department of Defense after this writing.

Q14. What class of material has a green warning color?

Q15. Other than warning colors, what else should be used to identify dangerous or hazardous materials?

Q16. The name or title of a gas should be painted in what color on the outside of the cylinder?

Q17. What does the secondary warning color of a material indicate?

Q18. What do arrows indicate on piping systems?